# General

## Guideline Title

Pneumonia in adults: diagnosis and management.

## Bibliographic Source(s)

National Clinical Guideline Centre. Pneumonia in adults: diagnosis and management. London (UK): National Institute for Health and Care Excellence (NICE); 2014 Dec 3. 26 p. (Clinical guideline; no. 191).

## Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

# Regulatory Alert

## FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- May 12, 2016 – Fluoroquinolone Antibacterial Drugs : The U.S. Food and Drug Administration (FDA) is advising that the serious side effects associated with fluoroquinolone antibacterial drugs generally outweigh the benefits for patients with sinusitis, bronchitis, and uncomplicated urinary tract infections who have other treatment options. For patients with these conditions, fluoroquinolones should be reserved for those who do not have alternative treatment options.

# Recommendations

## Major Recommendations

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance and related appendices.

The wording used in the recommendations in this guideline (for example, words such as 'offer' and 'consider') denotes the certainty with which the recommendation is made (the strength of the recommendation). The strength of recommendation is defined at the end of the "Major

Recommendations" field.

See the original guideline document for terms used in this guideline.

Presentation with Lower Respiratory Tract Infection

For people presenting with symptoms of lower respiratory tract infection in primary care, consider a point of care C-reactive protein test if after clinical assessment a diagnosis of pneumonia has not been made and it is not clear whether antibiotics should be prescribed. Use the results of the C-reactive protein test to guide antibiotic prescribing in people without a clinical diagnosis of pneumonia as follows:

- Do not routinely offer antibiotic therapy if the C-reactive protein concentration is less than 20 mg/litre.
- Consider a delayed antibiotic prescription (a prescription for use at a later date if symptoms worsen) if the C-reactive protein concentration is between 20 mg/litre and 100 mg/litre.
- Offer antibiotic therapy if the C-reactive protein concentration is greater than 100 mg/litre.

Community-Acquired Pneumonia

Severity Assessment in Primary Care

When a clinical diagnosis of community-acquired pneumonia is made in primary care, determine whether patients are at low, intermediate or high risk of death using the CRB65 score (see Box 1 in the original guideline document).

Use clinical judgement in conjunction with the CRB65 score to inform decisions about whether patients need hospital assessment as follows:

- Consider home-based care for patients with a CRB65 score of 0.
- Consider hospital assessment for all other patients, particularly those with a CRB65 score of 2 or more.

Severity Assessment in Hospital

When a diagnosis of community-acquired pneumonia is made at presentation to hospital, determine whether patients are at low, intermediate or high risk of death using the CURB65 score (see Box 2 in the original guideline document).

Use clinical judgement in conjunction with the CURB65 score to guide the management of community-acquired pneumonia, as follows:

- Consider home-based care for patients with a CURB65 score of 0 or 1.
- Consider hospital-based care for patients with a CURB65 score of 2 or more.
- Consider intensive care assessment for patients with a CURB65 score of 3 or more.

Stratify patients presenting with community-acquired pneumonia into those with low-, moderate- or high-severity disease. The grade of severity will usually correspond to the risk of death.

Microbiological Tests

Do not routinely offer microbiological tests to patients with low-severity community-acquired pneumonia.

For patients with moderate- or high-severity community-acquired pneumonia:

- Take blood and sputum cultures and
- Consider pneumococcal and legionella urinary antigen tests

Timely Diagnosis and Treatment

Put in place processes to allow diagnosis (including X-rays) and treatment of community-acquired pneumonia within 4 hours of presentation to hospital.

Offer antibiotic therapy as soon as possible after diagnosis, and certainly within 4 hours to all patients with community-acquired pneumonia who are admitted to hospital.

Antibiotic Therapy

*Low-Severity Community-Acquired Pneumonia*

Offer a 5-day course of a single antibiotic to patients with low-severity community-acquired pneumonia.

Consider amoxicillin in preference to a macrolide or a tetracycline for patients with low-severity community-acquired pneumonia. Consider a macrolide or a tetracycline for patients who are allergic to penicillin.

Consider extending the course of the antibiotic for longer than 5 days as a possible management strategy for patients with low-severity community-acquired pneumonia whose symptoms do not improve as expected after 3 days.

Explain to patients with low-severity community-acquired pneumonia treated in the community, and when appropriate their families or carers, that they should seek further medical advice if their symptoms do not begin to improve within 3 days of starting the antibiotic, or earlier if their symptoms are worsening.

Do not routinely offer patients with low-severity community-acquired pneumonia:

- A fluoroquinolone
- Dual antibiotic therapy

*Moderate- and High-Severity Community-Acquired Pneumonia*

Consider a 7- to 10-day course of antibiotic therapy for patients with moderate- or high-severity community-acquired pneumonia.

Consider dual antibiotic therapy with amoxicillin and a macrolide for patients with moderate-severity community-acquired pneumonia.

Consider dual antibiotic therapy with a beta-lactamase stable beta-lactam and a macrolide for patients with high-severity community-acquired pneumonia. Available beta-lactamase stable beta-lactams include co-amoxiclav, cefotaxime, ceftaroline fosamil, ceftriaxone, cefuroxime and piperacillin with tazobactam.

Glucocorticosteroid Treatment

Do not routinely offer a glucocorticosteroid to patients with community-acquired pneumonia unless they have other conditions for which glucocorticosteroid treatment is indicated.

Monitoring in Hospital

Consider measuring a baseline C-reactive protein concentration in patients with community-acquired pneumonia on admission to hospital, and repeat the test if clinical progress is uncertain after 48 to 72 hours.

Safe Discharge from Hospital

Do not routinely discharge patients with community-acquired pneumonia if in the past 24 hours they have had 2 or more of the following findings:

- Temperature higher than 37.5°C
- Respiratory rate 24 breaths per minute or more
- Heart rate over 100 beats per minute
- Systolic blood pressure 90 mmHg or less
- Oxygen saturation under 90% on room air
- Abnormal mental status
- Inability to eat without assistance

Consider delaying discharge for patients with community-acquired pneumonia if their temperature is higher than 37.5°C.

Patient Information

Explain to patients with community-acquired pneumonia that after starting treatment their symptoms should steadily improve, although the rate of improvement will vary with the severity of the pneumonia, and most people can expect that by:

- 1 week: fever should have resolved
- 4 weeks: chest pain and sputum production should have substantially reduced
- 6 weeks: cough and breathlessness should have substantially reduced
- 3 months: most symptoms should have resolved but fatigue may still be present
- 6 months: most people will feel back to normal

Advise patients with community-acquired pneumonia to consult their healthcare professional if they feel that their condition is deteriorating or not

improving as expected.

Hospital-Acquired Pneumonia

Antibiotic Therapy

Offer antibiotic therapy as soon as possible after diagnosis, and certainly within 4 hours, to patients with hospital-acquired pneumonia.

Choose antibiotic therapy in accordance with local hospital policy (which should take into account knowledge of local microbial pathogens) and clinical circumstances for patients with hospital-acquired pneumonia.

Consider a 5- to 10-day course of antibiotic therapy for patients with hospital-acquired pneumonia.

Definitions

Strength of Recommendations

Some recommendations can be made with more certainty than others. The Guideline Development Group (GDG) makes a recommendation based on the trade-off between the benefits and harms of an intervention, taking into account the quality of the underpinning evidence. For some interventions, the GDG is confident that, given the information it has looked at, most patients would choose the intervention. The wording used in the recommendations in this guideline denotes the certainty with which the recommendation is made (the strength of the recommendation).

*Interventions That Must (or Must Not) Be Used*

The GDG usually uses 'must' or 'must not' only if there is a legal duty to apply the recommendation. Occasionally the GDG uses 'must' (or 'must not') if the consequences of not following the recommendation could be extremely serious or potentially life threatening.

*Interventions That Should (or Should Not) Be Used – a 'Strong' Recommendation*

The GDG uses 'offer' (and similar words such as 'refer' or 'advise') when confident that, for the vast majority of patients, an intervention will do more good than harm, and be cost effective. The GDG uses similar forms of words (for example, 'Do not offer…') when confident that an intervention will not be of benefit for most patients.

*Interventions That Could Be Used*

The GDG uses 'consider' when confident that an intervention will do more good than harm for most patients, and be cost effective, but other options may be similarly cost effective. The choice of intervention, and whether or not to have the intervention at all, is more likely to depend on the patient's values and preferences than for a strong recommendation, and so the healthcare professional should spend more time considering and discussing the options with the patient.

## Clinical Algorithm(s)

A National Institute for Health and Care Excellence (NICE) pathway titled "Pneumonia Overview" is provided on the NICE Web site .

# Scope

## Disease/Condition(s)

- Community-acquired pneumonia (CAP)
- Hospital-acquired pneumonia (HAP)

## Guideline Category

Diagnosis

Evaluation

Management

Risk Assessment

Treatment

## Clinical Specialty

Family Practice

Infectious Diseases

Internal Medicine

Pulmonary Medicine

## Intended Users

Advanced Practice Nurses

Health Care Providers

Hospitals

Nurses

Patients

Pharmacists

Physician Assistants

Physicians

Respiratory Care Practitioners

## Guideline Objective(s)

To offer best practice guidance on the diagnosis and management of community-acquired pneumonia (CAP) and hospital-acquired pneumonia (HAP), based on systematic analysis of clinical and economic evidence with the aim of reducing mortality and morbidity from pneumonia and maximising resources

## Target Population

Adult patients (18 years and older) with suspected or confirmed community- or hospital-acquired pneumonia

Note: The following patients groups are not covered by this guideline: people younger than 18 years, patients who acquired pneumonia while intubated (ventilator-associated pneumonia) and/or on the intensive care unit (ITU), patients who are immunocompromised (have a primary immune deficiency or secondary immune deficiency related to human immunodeficiency virus [HIV] infection, or drug or systemic disease-induced immunosuppression), patients in whom pneumonia is an expected terminal event, pneumonia complicating bronchiectasis.

## Interventions and Practices Considered

<u>Diagnosis/Evaluation/Risk Assessment</u>

1. Clinical assessment
2. C-reactive protein (CRP) test
3. Mortality risk assessment and risk stratification using the CRB65 score or CURB65 score

4. Microbiological tests (blood and sputum cultures and pneumococcal and legionella urinary antigen tests)
5. Chest X-ray

Treatment/Management

1. Antibiotic therapy based on severity of disease
    - Amoxicillin
    - Macrolide
    - Tetracycline
    - Fluoroquinolone (not recommended routinely)
    - Dual antibiotic therapy (amoxicillin plus a macrolide, beta-lactamase stable beta-lactam plus a macrolide)
    - When to start treatment and duration of treatment
2. Glucocorticosteroid (not recommended for treatment of community-acquired pneumonia)
3. Monitoring in hospital (CRP measurement)
4. Procedures for safe discharge from hospital (ensuring stable body temperature, respiratory rate, heart rate, systolic blood pressure, oxygen saturation, mental status, ability to eat without assistance)
5. Providing patient information concerning what to expect in terms of symptom improvement

## Major Outcomes Considered

- Hospital admission or re-admission
- Antibiotic treatment
- Mortality
- Re-consultation
- Health-related quality-of-life
- Resolution of symptoms/treatment failure (opposite direction)
- Clinical cure (success or improvement as surrogates)
- Length of hospital stay
- Assessment for intensive care unit (ITU) admission (ITU admission, need for invasive ventilation or vasopressor support as surrogates)
- *Clostridium difficile*-associated diarrhoea
- Withdrawal due to adverse events
- Complication rates (composite of empyema, effusion, abscess, metastatic infection, superinfection, multiple organ dysfunction syndrome [MODS])
- Failure to respond to treatment (measured as clinical failure, clinical relapse or clinical instability)
- Test practicality
- Cost-effectiveness

# Methodology

## Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

## Description of Methods Used to Collect/Select the Evidence

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance and related appendices.

Developing the Review Questions and Outcomes

Review questions were developed in a PICO framework (patient, intervention, comparison and outcome) for intervention reviews, in a framework of population, index tests, reference standard and target condition for reviews of diagnostic test accuracy and using population, presence or absence of risk or protective factors under investigation (for example prognostic factors) and outcomes for prognostic reviews.

This use of a framework guided the literature searching process, critical appraisal and synthesis of evidence and facilitated the development of recommendations by the Guideline Development Group (GDG). The review questions were drafted by the NCGC technical team and refined and validated by the GDG. The questions were based on the key clinical areas identified in the scope (see Appendix A). A total of 17 review questions were identified (see Table 1 in the full version of the guideline).

Full literature searches, critical appraisals and evidence reviews were completed for all the specified review questions.

Searching for Evidence

Clinical Literature Search

Systematic literature searches were undertaken to identify all published clinical evidence relevant to the review questions. Searches were undertaken according to the parameters stipulated within The guidelines manual 2012 (see the "Availability of Companion Documents" field).

Databases were searched using relevant medical subject headings, free-text terms and study type filters where appropriate. Studies published in languages other than English were not reviewed. Where possible, searches were restricted to retrieve articles published in English. All searches were conducted in Medline, EMBASE, and The Cochrane Library. All searches were updated on 17 March 2014. Any studies added to the databases after this date (even those published prior to this date) were not included unless specifically stated in the text.

Search strategies were quality assured by cross checking reference lists of highly relevant papers, analysing search strategies in other systematic reviews and asking the GDG members to highlight any additional studies. The questions, the study types applied, the databases searched and the years covered can be found in Appendix F.

The titles and abstracts of records retrieved by the searches were sifted for relevance, with potentially significant publications obtained in full text. These were assessed against the inclusion criteria.

During the scoping stage, a search was conducted for guidelines and reports on Web sites of organisations relevant to the topic. Searching for grey literature or unpublished literature was not undertaken. Searches for electronic, ahead of print or "online early" publications are not routinely undertaken. All references suggested by stakeholders at the scoping consultation were considered.

Health Economic Literature Search

Systematic literature searches were also undertaken to identify health economic evidence within published literature relevant to the review questions. The evidence was identified by conducting a broad search relating to pneumonia in the National Health Service Economic Evaluation Database (NHS EED), the Health Economic Evaluations Database (HEED) and Health Technology Assessment (HTA) databases with no date restrictions. Additionally, the search was run on Medline and EMBASE using a specific economic filter, from 2011 to ensure recent publications that had not yet been indexed by the economic databases were identified. This was supplemented by additional searches that looked for economic papers specifically relating to gas exchange management as this was an area identified for original economic modelling. Studies published in languages other than English were not reviewed. Where possible, searches were restricted to articles published in English.

The search strategies for the health economics literature search are included in Appendix F. All searches were updated on 17 March 2014. No papers published after this date were considered.

Evidence of Effectiveness

The evidence was reviewed following the steps:

- Potentially relevant studies were identified for each review question from the relevant search results by reviewing titles and abstracts. Full papers were then obtained.
- Full papers were reviewed against pre-specified inclusion and exclusion criteria to identify studies that addressed the review question in the appropriate population and reported on outcomes of interest (review protocols are included in Appendix C).

Inclusion and Exclusion Criteria

The inclusion and exclusion of studies was based on the review protocols, which can be found in Appendix C. Excluded studies by review

question (with the reasons for their exclusion) are listed in Appendix J. The GDG was consulted about any uncertainty regarding inclusion or exclusion.

*Population*

The guideline population was defined to be adults diagnosed with pneumonia (hospital- or community-acquired).

For some review questions (such as assessing the prognostic role of C-reactive protein [CRP], procalcitonin [PCT] and chest X-ray [CXR] to inform antibiotic prescribing), the review population also included the general population of lower respiratory tract infection.

Regarding population characteristics, the following inclusion criteria were applied:

- Studies with mixed lower respiratory tract infection (LRTI) populations were included if results were stratified for community-acquired pneumonia (CAP) or if patients with CAP made up more than 75% of the sample.
- Studies with mixed CAP and nursing home pneumonia populations were included if patients with CAP made up more than 75% of the sample.
- Place of management was used as a surrogate for severity assessment and each study was assessed for directness of population. Patients with CAP managed outside hospital or as outpatients were considered to have low-severity CAP. Patients with CAP managed in hospital/intensive care unit (ITU) were considered to have high-severity CAP.
- Studies in which more than 50% of the patient population was assessed as having low-severity CAP based on severity assessment tools were reviewed within the low-severity CAP stratum even if patients were all managed in hospital.
- Studies in which the population was sub-grouped into suspected (for example, pneumococcal and non-pneumococcal) pneumonia origin were included as long as treatment was not delayed to determine aetiology.
- Adequate definition of hospital-acquired pneumonia (HAP) to clarify occurrence at least 48 hours after hospital admission.

Evidence of Cost-effectiveness

The GDG is required to make decisions based on the best available evidence of both clinical and cost effectiveness. Guideline recommendations should be based on the expected costs of the different options in relation to their expected health benefits (that is, their 'cost-effectiveness') rather than the total implementation cost. Thus, if the evidence suggests that a strategy provides significant health benefits at an acceptable cost per patient treated, it should be recommended even if it would be expensive to implement across the whole population.

Evidence on cost-effectiveness related to the key clinical issues being addressed in the guideline was sought.

- A systematic review of the published economic literature was undertaken.
- New cost-effectiveness analysis was conducted in priority areas.

Literature Review

The health economist:

- Identified potentially relevant studies for each review question from the economic search results by reviewing titles and abstracts. Full papers were then obtained.
- Reviewed full papers against pre-specified inclusion/exclusion criteria to identify relevant studies (see below for details)

Inclusion and Exclusion Criteria

Full economic evaluations (studies comparing costs and health consequences of alternative courses of action: cost-utility, cost-effectiveness, cost-benefit and cost-consequence analyses) and comparative costing studies that addressed the review question in the relevant population were considered potentially includable as economic evidence.

Studies were excluded that only reported cost per hospital (not per patient), or only reported average cost effectiveness without disaggregated costs and effects. Literature reviews, abstracts, posters, reviews, letters, editorials, comment articles, unpublished studies and studies not in English were excluded.

Remaining studies were prioritised for inclusion based on their relative applicability to the development of this guideline and the study limitations. For example, if a high quality, directly applicable UK analysis was available, then other less relevant studies may not have been included. Where exclusions occurred on this basis, this is noted in the relevant section.

For more details about the assessment of applicability and methodological quality see the economic evaluation checklist (Appendix G of the

guidelines manual, and the health economics review protocol in Appendix C of the full guideline appendices).

When no relevant economic studies were found from the economic literature review, relevant UK National Health Service (NHS) unit costs related to the compared interventions were presented to the GDG to inform the possible economic implications of the recommendations.

## Number of Source Documents

See Appendix D (see the "Availability of Companion Documents" field) for clinical article selection flow charts, which provide the number of records identified, screened and assessed for eligibility, as well as the total number of studies included and excluded in review for each of the guideline topics. See Appendix E for an economic article selection flow chart.

## Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

## Rating Scheme for the Strength of the Evidence

Overall Quality of Outcome Evidence in Grading of Recommendations Assessment, Development and Evaluation (GRADE)

| Level | Description |
|---|---|
| **High** | Further research is very unlikely to change confidence in the estimate of effect. |
| **Moderate** | Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate. |
| **Low** | Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate. |
| **Very Low** | Any estimate of effect is very uncertain. |

## Methods Used to Analyze the Evidence

Meta-Analysis

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

## Description of the Methods Used to Analyze the Evidence

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance and related appendices.

Evidence of Effectiveness

The evidence was reviewed following the steps shown schematically in Figure 2 in the full version of the guideline:

- Relevant studies were critically appraised using the appropriate checklist as specified in The guidelines manual 2012 (see the "Availability of Companion Documents" field) for diagnostic questions the QUADASâ€2 checklist was followed.
- Key information was extracted on the study's methods, PICO (patient, intervention, comparison and outcome) factors and results. These were presented in summary tables in each chapter and evidence tables (in Appendix G).
- Summaries of evidence were generated by outcome and were presented in Guideline Development Group (GDG) meetings:
    - Randomised studies: data were meta-analysed where appropriate and reported in Grading of Recommendations Assessment, Development and Evaluation (GRADE) profiles (for intervention reviews).
    - Observational studies: data were presented as a range of values or meta-analysed (where appropriate) in GRADE profiles and

usually this was organised by outcomes. When observational studies with multivariate analyses were included, these were presented separately as the confounding factors in the analyses were often not the same across studies. When comparative observational studies presented frequency data along with results from a multivariate analysis, the adjusted estimate of relative effect size (adjusted odds ratio [OR] or risk ratio [RR]) was presented along with the absolute effect size (which was calculated based on the frequencies of 2 groups).

- Diagnostic studies were presented as measures of diagnostic test accuracy (sensitivity, specificity, positive and negative predictive value, area under the curve). A meta-analysis could not be conducted due to heterogeneity of included studies.
- Prognostic studies: data were presented as a range of values, usually in terms of the relative effect as reported by the authors. For the severity assessment review, meta-analysis was conducted to calculate the absolute effect measure when the data were available. However, for the presentation of relative effect, it was decided to include the RR of the median study with the range of RRs of all included studies in order to capture a more representative distribution of relative effects of all available evidence.
- Qualitative studies: the themes of the studies were organised in a modified version of a GRADE profile, where possible, along with quality assessment otherwise presented in a narrative form.

Eighty percent of all data extracted was quality assured by a second reviewer. Fifty percent of the GRADE quality assessment was quality assured by a second reviewer to minimise any potential risk of reviewer bias or error.

Methods of Combining Clinical Studies

*Data Synthesis for Intervention Reviews*

Where possible, meta-analyses were conducted to combine the results of studies for each review question using Cochrane Review Manager (RevMan5) software. Fixed-effects (Mantel-Haenszel) techniques were used to calculate RRs (relative risk) for the binary outcomes such as mortality and intensive care unit (ITU) admission.

For the continuous outcomes, measures of central tendency (mean) and variation (standard deviation) were required for metaâ€analysis. Data for continuous outcomes such as length of hospital stay and duration of antibiotic therapy were analysed using an inverse variance method for pooling weighted mean differences and, where the studies had different scales, standardised mean differences were used. A generic inverse variance option in RevMan5 was used if any studies reported solely the summary statistics and 95% confidence interval (95% CI) or standard error; this included any hazard ratios reported. However, in cases where standard deviations were not reported per intervention group, the standard error (SE) for the mean difference was calculated from other reported statistics (p values or 95% CIs) if available; metaâ€analysis was then undertaken for the mean difference and SE using the generic inverse variance method in RevMan5. When the only evidence was based on studies that summarised results by presenting medians (and interquartile ranges), or only p values were given, this information was assessed in terms of the study's sample size and was included in the GRADE tables without calculating the relative or absolute effects or as a narrative summary. Consequently, aspects of quality assessment such as imprecision of effect could not be assessed for evidence of this type and this has been recorded in the footnotes of the GRADE tables. When more than 2 studies reported a continuous outcome, the presentation of mean (SD) per comparison group was taken by averaging the means of included studies.

Where reported, time-to-event data were presented as a hazard ratio or results from a Cox hazard proportion model were given as a result from a multivariate analysis.

Stratified analyses were predefined for some review questions at the protocol stage when the GDG identified that these strata to be different in terms of clinical characteristics and the interventions were expected to have a different effect on low-, intermediate- and high-risk groups for community-acquired pneumonia (CAP).

Statistical heterogeneity was assessed by visually examining the forest plots, and by considering the chi-squared test for significance at $p < 0.1$ or an I-squared inconsistency statistic (with an I-squared value of more than 50% indicating considerable heterogeneity). If the heterogeneity still remained, a random-effects (DerSimonian and Laird) model was employed to provide a more conservative estimate of the effect. Where considerable heterogeneity was present, the GDG set out to perform predefined subgroup analyses based on the following factors:

- Intravenous and oral administration
- Standard duration of treatment compared with no standard duration (for most antibiotics the standard duration is 7 days)
- Predominant disease aetiology (including resistance profiles)
- Community-acquired pneumonia (CAP) in primary care with chest X-ray (CXR)-confirmed diagnosis or clinical assessment alone

For interpretation of the binary outcome results, differences in the absolute event rate were calculated using the GRADEpro software, for the median event rate across the control arms of the individual studies in the metaâ€analysis. Absolute risk differences were presented in the GRADE profiles and in clinical summary of findings tables, for discussion with the GDG.

When the only results presented in the studies were in relation to multivariate analysis (adjusted RR, OR or hazard ratio [HR]), forest plots were not produced and the estimate of absolute effect size could not be calculated.

Network meta-analyses (NMA) for assessing the relative efficacy of antibiotic therapies for either CAP or hospital-acquired pneumonia (HAP) were not performed. The aim of an NMA is to include all relevant evidence in order both to answer questions on the clinical effectiveness of interventions when no direct comparison is available and to give a ranking of treatments in terms of efficacy. The decision not to conduct a NMA was mutually agreed by the technical team and the GDG considering the following:

- Heterogeneity of the patient groups in the different studies
- Many of the included trials were old and as such fluctuations in epidemiology of pathogens and resistance profiles are subject to change
- The non-representative nature of the patients in most of the studies (particularly the age difference when compared with those with pneumonia in the UK population)
- Different definitions of outcomes (such as clinical cure)
- The mixture of non-inferiority and superiority studies
- The majority of evidence was of low to very low quality

The GDG agreed that they would not have any confidence in the results of an NMA. In addition, no randomised controlled trial (RCT) data was found for one comparison of the most commonly prescribed antibiotic therapies for pneumonia in UK clinical practice (beta-lactam compared with a beta-lactam and macrolide), thus limiting the applicability of findings from a NMA which would include only RCTs.

*Data Synthesis for Prognostic Factor Reviews*

ORs, RRs or HRs, with their 95% CIs for the effect of the preâ€specified prognostic factors were extracted from the papers. Although the protocol was set up to look first at RCTs (of mainly test and treat study design), prospective cohort studies with the appropriate study population were also considered to be high-quality evidence to answer these questions. Prospective cohort studies were preferred if they reported multivariate analyses, including key confounders as identified by the GDG at the protocol stage for a specific outcome. The GDG considered that age, comorbidities (with more emphasis on previous heart, lung and liver disease) and malignancies could skew the predictive ability of the investigated tools to assess mainly mortality and ITU admission for patients with CAP. If the severity tools took these confounders into consideration in their scoring, then univariate analysis was still considered valid to address this question.

For the severity assessment review in which the GDG assessed the role of several severity assessment tools to categorize patients into risk groups related to the likelihood of experiencing outcomes (most importantly mortality and ITU admission), 2 approaches were used to summarize the evidence:

- Summary of discriminatory analysis; a receiver operator characteristics (ROC) curve using the performance criteria for each severity assessment tool, and the area under these curves (AUC). The AUCs were approximated for some tools, such as the revised American Thoracic Society score (rATS), which were scored as binary outcomes. The results of the largest observational studies were highlighted.
- Data were summarised in GRADE tables for the studies that tested the same tools. Frequencies were summarised across all studies per risk group for the same tool. Given the heterogeneity of observational studies, the GDG presented the relative RR of the median study and the range of RRs of all included studies. However, the absolute effect was derived from the pooled estimate of effect size (from meta-analysis). This was decided in order to make the best use of all the included studies to inform decision-making.

*Data Synthesis for Diagnostic Test Accuracy Review*

For diagnostic test accuracy studies, the following outcomes were reported: sensitivity, specificity, positive predictive value, negative predictive value, and area under the curve (AUC; 0.9-1: excellent, 0.8-0.9: good, 0.7-0.8: fair, 0.60-0.70: poor, <0.5: fail). Heterogeneity is represented on a ROC curve by vertical displacements around the ROC curve, and this was examined in subgroup analyses when possible.

*Data Synthesis for Qualitative Review*

For the qualitative review in the guideline, results were presented in 2 ways:

- A modified version of the GRADE table was used by summarising the information on the included studies in relation to themes around the outcomes in the review. NICE checklists on assessing qualitative studies were used to assess the quality assessment of individual studies.
- Results were reported narratively either by individual study or by summarising the range of values as reported across similar studies.

Type of Analysis

Estimates of effect from individual studies were based on available case analysis (ACA): that is, analysing only data that were available for

participants at the end of follow-up, without making any imputations for missing data. The GDG recorded several potential reasons for people with pneumonia dropping out before trial completion:

- Adverse effects (including deaths)
- Withdrawal of consent
- Investigator's discretion
- Loss to follow-up (e.g., moving house, second opinions from clinicians not in the study)

d was used rather than an intention-to-treat with imputation analysis (ITT), in order to avoid making assumptions about the participants for whom outcome data was not available, and furthermore assuming that those with missing outcome data had the same event rate as those who continued. In addition, ITT analysis tends to bias the results towards no difference, and therefore the effect may be smaller than in reality. Using ACA, the GDG avoided incorrectly weighting studies in meta-analysis by using a denominator that does not reflect the true sample size with outcome data available. If there was a differential missing data rate between the 2 arms in a study that was greater than 10%, a sensitivity analysis was performed to determine whether the size and direction of effect would be changed by using an ITT or ACA analysis and whether there was an impact on the meta-analysis. If this were the case, a footnote in the GRADE tables was added to describe the dependence on these assumptions. However, the majority of trials included in the review of evidence for this guideline had less than 10% differential missing outcome data.

When the studies reported only ITT results (through imputation), and the number of events was larger than the number of completers in the trial (ACA), the GDG used the ITT analysis (they used the proportion of events from the ITT numbers to derive the number of events for the final sample size of completers).

Appraising the Quality of Evidence by Outcomes

The evidence for outcomes from the included RCTs and, where appropriate, observational studies was evaluated and presented using an adaptation of the "Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox" developed by the international GRADE working group (http://www.gradeworkinggroup.org/ ). The software developed by the GRADE working group (GRADEpro) was used to assess the quality of each outcome, taking into account individual study quality factors and the meta-analysis results. The 'Clinical/Economic evidence profile' table includes details of the quality assessment and pooled outcome data, where appropriate, an absolute measure of intervention effect and the summary of quality of evidence for that outcome. In this table, the columns for intervention and control indicate summary measures and measures of dispersion (such as mean and standard deviation or median and range) for continuous outcomes and frequency of events (n/N: the sum across studies of the number of patients with events divided by sum of the number of completers) for binary outcomes. Reporting or publication bias was only taken into consideration in the quality assessment and included in the 'Clinical evidence profile' table if it was apparent.

The evidence for each outcome was examined separately for the quality elements listed and defined in Table 2 of the full version of the guideline. Each element was graded using quality levels listed in Table 3 of the full version of the guideline.

The main criteria considered in the rating of these elements are discussed below. Footnotes were used to describe reasons for grading a quality element as having serious or very serious limitations. The ratings for each component were summed to obtain an overall assessment for each outcome (see the "Rating Scheme for the Strength of the Evidence" field).

The GRADE toolbox is currently designed only for randomised trials and observational studies but the GDG adapted the quality assessment elements and outcome presentation for diagnostic accuracy and prognostic studies subject to data availability.

Grading the Quality of Clinical Evidence

After results were pooled, the overall quality of evidence for each outcome was considered. The following procedure was adopted when using GRADE:

1. A quality rating was assigned, based on the study design. RCTs start High, observational studies as Low, and uncontrolled case series as Low or Very low, with the exception of prognostic studies for which observational studies are initially rated as High quality.
2. The rating was then downgraded for the specified criteria: risk of bias (study limitations), inconsistency, indirectness, imprecision and publication bias. These criteria are detailed in Section 5.3 of the full version of the guideline. Evidence from observational studies (which had not previously been downgraded) was upgraded if there was: a large magnitude of effect, a dose-response gradient, and if all plausible confounding would reduce a demonstrated effect or suggest a spurious effect when results showed no effect. Each quality element considered to have 'serious' or 'very serious' risk of bias was rated down by 1 or 2 points respectively.
3. The downgraded/upgraded ratings were then summed and the overall quality rating was revised. For example, all RCTs started as High and the overall quality became Moderate, Low or Very low if 1, 2 or 3 points were deducted respectively.

4. The reasons or criteria used for downgrading were specified in the footnotes.

The details of the criteria used for each of the main quality elements are discussed further in Sections 5.3.6 to 5.3.9 of the full guideline.

Assessing Clinical Importance

The GDG assessed the evidence by outcome in order to determine if there was, or potentially was, a clinically important benefit, a clinically important harm or no clinically important difference between interventions. To facilitate this, binary outcomes were converted into absolute risk differences (ARDs) using GRADEpro software: the median control group risk across studies was used to calculate the ARD and its 95% CI from the pooled RR.

The assessment of benefit, harm, or no benefit or harm was based on the point estimate of absolute effect for intervention studies which was standardised across the reviews.

This assessment was carried out by the GDG for each critical outcome, and an evidence summary table was produced to compile the GDG's assessments of clinical importance per outcome, alongside the evidence quality and the uncertainty in the effect estimate (imprecision).

Evidence Statements

Evidence statements are summary statements that are presented after the GRADE profiles, summarising the key features of the clinical evidence presented. The wording of the evidence statements reflects the certainty or uncertainty in the estimate of effect. The evidence statements are presented by comparison (for intervention reviews) or by outcome and encompass the following key features of the evidence:

- The number of studies and the number of participants for a particular outcome
- A brief description of the participants
- An indication of the direction of effect (if one treatment is beneficial or harmful compared with the other, or whether there is no difference between the 2 tested treatments)
- A description of the overall quality of evidence (GRADE overall quality)

Evidence of Cost-effectiveness

The GDG is required to make decisions based on the best available evidence of both clinical and cost effectiveness. Guideline recommendations should be based on the expected costs of the different options in relation to their expected health benefits (that is, their 'cost effectiveness') rather than the total implementation cost. Thus, if the evidence suggests that a strategy provides significant health benefits at an acceptable cost per patient treated, it should be recommended even if it would be expensive to implement across the whole population.

Evidence on cost effectiveness related to the key clinical issues being addressed in the guideline was sought.

- A systematic review of the published economic literature was undertaken.
- New cost-effectiveness analysis was conducted in priority areas.

Literature Review

The health economist:

- Critically appraised relevant studies using the economic evaluations checklist as specified in The guidelines manual (see the "Availability of Companion Documents" field)
- Extracted key information about study methods and results into evidence tables (included in Appendix H)
- Generated summaries of the evidence in NICE economic evidence profiles (included in the relevant chapter for each review question) – see below for details

NICE Economic Evidence Profiles

The NICE economic evidence profile has been used to summarise cost and cost-effectiveness estimates. The economic evidence profile shows, for each economic study, an assessment of applicability and methodological quality for each economic evaluation, with footnotes indicating the reasons for the assessment. These assessments were made by the health economist using the economic evaluation checklist from the guidelines manual (see the "Availability of Companion Documents" field). It also shows the incremental costs, incremental effects (for example, quality-adjusted life years [QALYs]) and the incremental cost-effectiveness ratio for the base-case analysis in the evaluation, as well as information about the assessment of uncertainty in the analysis.

If a non-UK study was included in the profile, the results were converted into pounds sterling using the appropriate purchasing power parity.

## Methods Used to Formulate the Recommendations

Expert Consensus

Informal Consensus

## Description of Methods Used to Formulate the Recommendations

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) on behalf of the National Institute for Health and Care Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance and related appendices.

Who Developed This Guideline?

A multidisciplinary Guideline Development Group (GDG) comprising health professionals and researchers as well as a lay member developed this guideline.

NICE funds the NCGC and thus supported the development of this guideline. The GDG was convened by the NCGC and chaired in accordance with guidance from NICE.

The group met every 4-6 weeks during the development of the guideline.

Staff from the NCGC provided methodological support and guidance for the development process. The team working on the guideline included a project manager, systematic reviewers, health economists and information scientists. They undertook systematic searches of the literature, appraised the evidence, conducted meta-analysis and cost-effectiveness analysis where appropriate and drafted the guideline in collaboration with the GDG.

Developing Recommendations

Over the course of the guideline development process, the GDG was presented with:

- Evidence tables of the clinical and economic evidence reviewed from the literature. All evidence tables are in Appendix G and Appendix H in the full guideline appendices.
- Summary of clinical and economic evidence and quality
- Forest plots and summary ROC curves (Appendix I)
- A description of the methods and results of the cost-effectiveness analysis undertaken for the guideline (Appendix L)

Recommendations were drafted on the basis of the GDG interpretation of the available evidence, taking into account the balance of benefits, harms and costs between different courses of action. This was either done formally in an economic model, or informally. Firstly, the net benefit over harm (clinical effectiveness) was considered, focusing on the critical outcomes. When this was done informally, the GDG took into account the clinical benefits and harms when one intervention was compared with another. The assessment of net benefit was moderated by the importance placed on the outcomes (the GDG's values and preferences), and the confidence the GDG had in the evidence (evidence quality). Secondly, it was assessed whether the net benefit justified any differences in costs.

When clinical and economic evidence was of poor quality, conflicting or absent, the GDG drafted recommendations based on their expert opinion. The considerations for making consensus-based recommendations include the balance between potential harms and benefits, the economic costs or implications compared with the economic benefits, current practices, recommendations made in other relevant guidelines, patient preferences and equality issues. The consensus recommendations were agreed through discussions in the GDG, and through methods of consensus (via a Web-based questionnaire). Formal methods of consensus were not used. The GDG also considered whether the uncertainty was sufficient to justify delaying making a recommendation to await further research, taking into account the potential harm of failing to make a clear recommendation.

The wording of recommendations was agreed by the GDG and focused on the following factors:

- The actions health professionals need to take
- The information readers need to know
- The strength of the recommendation (for example the word 'offer' was used for strong recommendations and 'consider' for weak

recommendations)
- The involvement of patients (and their carers if needed) in decisions on treatment and care
- Consistency with NICE's standard advice on recommendations about drugs, waiting times and ineffective interventions

The main considerations specific to each recommendation are outlined in the 'Recommendations and link to evidence' sections within each chapter in the full version of the guideline.

## Rating Scheme for the Strength of the Recommendations

Strength of Recommendations

Some recommendations can be made with more certainty than others. The Guideline Development Group (GDG) makes a recommendation based on the trade-off between the benefits and harms of an intervention, taking into account the quality of the underpinning evidence. For some interventions, the GDG is confident that, given the information it has looked at, most patients would choose the intervention. The wording used in the recommendations in this guideline denotes the certainty with which the recommendation is made (the strength of the recommendation).

Interventions That Must (or Must Not) Be Used

The GDG usually uses 'must' or 'must not' only if there is a legal duty to apply the recommendation. Occasionally the GDG uses 'must' (or 'must not') if the consequences of not following the recommendation could be extremely serious or potentially life threatening.

Interventions That Should (or Should Not) Be Used – a 'Strong' Recommendation

The GDG uses 'offer' (and similar words such as 'refer' or 'advise') when confident that, for the vast majority of patients, an intervention will do more good than harm, and be cost effective. The GDG uses similar forms of words (for example, 'Do not offer…') when confident that an intervention will not be of benefit for most patients.

Interventions That Could Be Used

The GDG uses 'consider' when confident that an intervention will do more good than harm for most patients, and be cost effective, but other options may be similarly cost effective. The choice of intervention, and whether or not to have the intervention at all, is more likely to depend on the patient's values and preferences than for a strong recommendation, and so the healthcare professional should spend more time considering and discussing the options with the patient.

## Cost Analysis

Undertaking New Health Economic Analysis

As well as reviewing the published economic literature for each review question, new economic analysis was undertaken by the health economist in selected areas. Priority areas for new health economic analysis were agreed by the Guideline Development Group (GDG) after formation of the review questions and consideration of the available health economic evidence.

The GDG identified microbiological tests as the highest priority area for original economic modelling. Due to the likely considerable variation in clinical practice, differences in costs, and potential impact on quality-of-life there is uncertainty over the cost effectiveness of different microbiological tests alone or in combination.

The following general principles were adhered to in developing the cost-effectiveness analysis.

- Methods were consistent with the National Institute for Health and Care Excellence (NICE) reference case.
- The GDG was involved in the design of the model, selection of inputs and interpretation of the results.
- Model inputs were based on the systematic review of the clinical literature supplemented with other published data sources where possible.
- When published data was not available GDG expert opinion was used to populate the model.
- Model inputs and assumptions were reported fully and transparently.
- The results were subject to sensitivity analysis and limitations were discussed.
- The model was peer-reviewed by another health economist at the National Clinical Guideline Centre (NCGC).

Full methods for the cost-effectiveness analysis for microbiological tests are described in Appendix L (see the "Availability of Companion Documents" field). See below for a summary of results of this analysis.

Cost-effectiveness Criteria

NICE's report 'Social value judgements: principles for the development of NICE guidance' sets out the principles that GDGs should consider when judging whether an intervention offers good value for money.

In general, an intervention was considered to be cost effective if either of the following criteria applied (given that the estimate was considered plausible).

a. The intervention dominated other relevant strategies (that is, it was both less costly in terms of resource use and more clinically effective compared with all the other relevant alternative strategies), or
b. The intervention cost less than £20,000 per quality-adjusted life year (QALY) gained compared with the next best strategy.

If the GDG recommended an intervention that was estimated to cost more than £20,000 per QALY gained, or did not recommend one that was estimated to cost less than £20,000 per QALY gained, the reasons for this decision are discussed explicitly in the 'Recommendations and link to evidence' section of the relevant chapter in the full version of the guideline with reference to issues regarding the plausibility of the estimate or to the factors set out in 'Social value judgements: principles for the development of NICE guidance' guidance'.

If a study reported the cost per life year gained but not QALYs, the cost per QALY gained was estimated by multiplying by an appropriate utility estimate to aid interpretation. The estimated cost per QALY gained is reported in the economic evidence profile with a footnote detailing the life-years gained and the utility value used. When QALYs or life years gained are not used in the analysis, results are difficult to interpret unless one strategy dominates the others with respect to every relevant health outcome and cost.

In the Absence of Economic Evidence

When no relevant published studies were found, and a new analysis was not prioritised, the GDG made a qualitative judgement about cost effectiveness by considering expected differences in resource use between options and relevant UK National Health Service (NHS) unit costs alongside the results of the clinical review of effectiveness evidence.

See the economic evidence in the relevant chapter for each review question in the full version of the guideline. See also Appendix L (see the "Availability of Companion Documents" field) for cost-effectiveness analysis for microbiological tests in patients with moderate- and high-severity community-acquired pneumonia.

## Method of Guideline Validation

External Peer Review

Internal Peer Review

## Description of Method of Guideline Validation

Validation Process

This guidance is subject to a 6-week public consultation and feedback as part of the quality assurance and peer review of the document. All comments received from registered stakeholders are responded to in turn and posted on the National Institute for Health and Care Excellence (NICE) Web site when the pre-publication check of the full guideline occurs.

# Evidence Supporting the Recommendations

## Type of Evidence Supporting the Recommendations

Type of Studies

Randomised trials, nonâ€randomised trials, and observational studies (including diagnostic or prognostic studies) were included in the evidence reviews as appropriate.

Conference abstracts were not automatically excluded from the review but were initially assessed against the inclusion criteria and included only if

no other published full paper was available for a particular review question.

Literature reviews, posters, letters, editorials, comment articles, unpublished studies and studies not in English were excluded.

For most intervention reviews in this guideline, parallel randomised controlled trials (RCTs) were included because they are considered the most robust study design for unbiased estimation of intervention effects. Crossover RCTs were not appropriate for any of the interventional questions as they were designed to test the relative efficacy of antibiotics and the carry over effect of cross over trials would be a bias in the estimate of these effects.

If the Guideline Development Group (GDG) believed RCT data were not appropriate or there was limited evidence from RCTs, well-conducted nonâ€randomised comparative studies were included. Please refer to Appendix C (see the "Availability of Companion Documents" field) for full details on the study design of studies selected for each review question. For example the GDG noticed that it was unlikely that there was randomised evidence for the comparison of beta-lactam with beta-lactam plus a macrolide, so observational studies with multivariate analyses were also considered for this (most commonly prescribed) comparison only.

For diagnostic reviews, crossâ€sectional and retrospective studies were included. For prognostic reviews, prospective and retrospective cohort studies were included. Case-control or case series studies were not included for any review question.

# Benefits/Harms of Implementing the Guideline Recommendations

## Potential Benefits

- Significant reduction in antibiotic prescription rates
- Reduced morbidity and mortality in patients who receive targeted treatment

See also the "Trade-off between clinical benefits and harms" sections in the full version of the guideline (see the "Availability of Companion Documents" field) for benefits of specific interventions.

## Potential Harms

- Misdiagnosis and inappropriate prescribing, which could result in harm to patients (such as adverse events due to antibiotic therapy) and to the wider population (such as increased antibiotic resistance)
- Treatment-related adverse events
- *Clostridium difficile*-associated diarrhoea
- Development of antibiotic resistance

See also the "Trade-off between clinical benefits and harms" sections in the full version of the guideline (see the "Availability of Companion Documents" field) for additional discussion of harms of specific interventions.

# Qualifying Statements

## Qualifying Statements

- This guidance represents the view of the National Institute for Health and Care Excellence (NICE), which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summaries of product characteristics of any drugs.
- Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity and foster good relations. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

- Health care providers need to use clinical judgement, knowledge and expertise when deciding whether it is appropriate to apply guidelines. The recommendations cited here are a guide and may not be appropriate for use in all situations. The decision to adopt any of the recommendations cited here must be made by practitioners in light of individual patient circumstances, the wishes of the patient, clinical expertise and resources.
- The National Clinical Guideline Centre (NCGC) was commissioned by the NICE to undertake the work on this guideline.
- The guideline will assume that prescribers will use a drug's summary of product characteristics to inform decisions made with individual patients.
- See the "Patient-centred care" section in the original guideline document for information about individual needs and preferences and transition of care.

# Implementation of the Guideline

## Description of Implementation Strategy

Implementation tools and resources to help put the guideline into practice are available (see also the "Availability of Companion Documents" field).

Key Priorities for Implementation

The following recommendations have been identified as priorities for implementation.

Presentation with Lower Respiratory Tract Infection

For people presenting with symptoms of lower respiratory tract infection in primary care, consider a point of care C-reactive protein test if after clinical assessment a diagnosis of pneumonia has not been made and it is not clear whether antibiotics should be prescribed. Use the results of the C-reactive protein test to guide antibiotic prescribing in people without a clinical diagnosis of pneumonia as follows:

- Do not routinely offer antibiotic therapy if the C-reactive protein concentration is less than 20 mg/litre.
- Consider a delayed antibiotic prescription (a prescription for use at a later date if symptoms worsen) if the C-reactive protein concentration is between 20 mg/litre and 100 mg/litre.
- Offer antibiotic therapy if the C-reactive protein concentration is greater than 100 mg/litre.

Community-Acquired Pneumonia

*Microbiological Tests*

For patients with moderate- or high-severity community-acquired pneumonia:

- Take blood and sputum cultures and
- Consider pneumococcal and legionella urinary antigen tests

*Timely Diagnosis and Treatment*

Put in place processes to allow diagnosis (including X-rays) and treatment of community-acquired pneumonia within 4 hours of presentation to hospital.

*Antibiotic Therapy*

Low-Severity Community-Acquired Pneumonia

Offer a 5-day course of a single antibiotic to patients with low-severity community-acquired pneumonia.

Do not routinely offer patients with low-severity community-acquired pneumonia:

- A fluoroquinolone
- Dual antibiotic therapy

*Patient Information*

Explain to patients with community-acquired pneumonia that after starting treatment their symptoms should steadily improve, although the rate of improvement will vary with the severity of the pneumonia, and most people can expect that by:

- 1 week: fever should have resolved
- 4 weeks: chest pain and sputum production should have substantially reduced
- 6 weeks: cough and breathlessness should have substantially reduced
- 3 months: most symptoms should have resolved but fatigue may still be present
- 6 months: most people will feel back to normal

### Implementation Tools

Audit Criteria/Indicators

Clinical Algorithm

Mobile Device Resources

Patient Resources

Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

## Institute of Medicine (IOM) National Healthcare Quality Report Categories

### IOM Care Need

Getting Better

### IOM Domain

Effectiveness

Patient-centeredness

Timeliness

## Identifying Information and Availability

### Bibliographic Source(s)

National Clinical Guideline Centre. Pneumonia in adults: diagnosis and management. London (UK): National Institute for Health and Care Excellence (NICE); 2014 Dec 3. 26 p. (Clinical guideline; no. 191).

### Adaptation

Not applicable: The guideline was not adapted from another source.

## Date Released

2014 Dec 3

## Guideline Developer(s)

National Guideline Centre - National Government Agency [Non-U.S.]

## Source(s) of Funding

The National Clinical Guideline Centre (NCGC) was commissioned by the National Institute for Health and Care Excellence (NICE) to undertake the work on this guideline.

## Guideline Committee

Guideline Development Group (GDG)

## Composition of Group That Authored the Guideline

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## Financial Disclosures/Conflicts of Interest

At the start of the guideline development process all Guideline Development Group (GDG) members declared interests including consultancies, fee-paid work, share-holdings, fellowships and support from the healthcare industry. At all subsequent GDG meetings, members declared arising conflicts of interest.

Members were either required to withdraw completely or for part of the discussion if their declared interest made it appropriate. The details of declared interests and the actions taken are shown in Appendix B in the full guideline appendices (see the "Availability of Companion Documents" field).

## Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

## Guideline Availability

Available from the National Institute for Health and Care Excellence (NICE) Web site. Also available for download in ePub and eBook formats from the NICE Web site.

## Availability of Companion Documents

The following are available:

- Pneumonia. Diagnosis and management of community- and hospital-acquired pneumonia in adults. Full guideline. London (UK): National Institute for Health and Care Excellence; 2014 Dec. 448 p. (Clinical guideline; no. 191). Available from the National Institute for Health and Care Excellence (NICE) Web site.
- Pneumonia. Diagnosis and management of community- and hospital-acquired pneumonia in adults. Appendices. London (UK): National Institute for Health and Care Excellence; 2014 Dec. (Clinical guideline; no. 191). Available from the NICE Web site.
- Pneumonia in adults: diagnosis and management. Baseline assessment tool. London (UK): National Institute for Health and Care Excellence; 2014 Dec. (Clinical guideline; no. 191). Available from the NICE Web site.
- Pneumonia in adults: diagnosis and management. Clinical audit tool. London (UK): National Institute for Health and Care Excellence; 2014 Dec. (Clinical guideline; no. 191). Available from the NICE Web site.
- Pneumonia. Diagnosis and management of community- and hospital-acquired pneumonia in adults. Costing statement. London (UK): National Institute for Health and Care Excellence; 2014 Dec. 10 p. (Clinical guideline; no. 191). Available from the NICE Web site.
- Pneumonia in adults: diagnosis and management. Implementation podcast. London (UK): National Institute for Health and Care Excellence; 2014 Dec. (Clinical guideline; no. 191). Available from the NICE Web site.
- The guidelines manual 2012. London (UK): National Institute for Health and Care Excellence (NICE); 2012 Nov. Available from the NICE Web site.

## Patient Resources

The following is available:

- Pneumonia in adults: diagnosis and management. Information for the public. London (UK): National Institute for Health and Care Excellence; 2014 Dec. 8 p. (Clinical guideline; no. 191). Available from the National Institute for Health and Care Excellence (NICE) Web site. Also available for download in eBook and ePub formats from the NICE Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

## NGC Status

This NGC summary was completed by ECRI Institute on April 5, 2016. This summary was updated by ECRI Institute on May 18, 2016 following the U.S. Food and Drug Administration advisory on Fluoroquinolone Antibacterial Drugs.

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## Copyright Statement

# Disclaimer

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